

\*\*\*\*\*  
NAVFAC IGS-16442 (MAY 2002)  
-----  
Preparing Activity: LANTNAVFACENGCOM Based on UFGS-16442N

ITALIAN GUIDE SPECIFICATIONS

Use for ITALIAN projects only

\*\*\*\*\*

SECTION 16442

SWITCHBOARDS, LOW-VOLTAGE  
05/02

\*\*\*\*\*

NOTE: This guide specification is issued by the  
Atlantic Division, Naval Facilities Engineering  
Command for regional use in Italy.

\*\*\*\*\*

\*\*\*\*\*

NOTE: This section shall be used for guidance only  
in the development of Italian specifications for  
jobs. This section does not include UFGS-16442N  
specifications completely. Refer to Section  
UFGS-16442N for format and to ensure that job  
requirements are included in their entirety.

\*\*\*\*\*

\*\*\*\*\*

Comments and suggestion on this specification are  
welcome and should be directed to the technical  
proponent of the specification. A listing of the  
technical proponents, including their organization  
designation and telephone number, is on the Internet.

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer  
choices or locations where text must be supplied by  
the designer.

\*\*\*\*\*

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the  
extent referenced. The publications are referred to within the text by the  
basic designation only.

Italian Electrotechnical Commission (Comitato Elettrotecnico  
Italiano) (CEI) Publications

CEI 7-6	Test of hot-dip galvanization for ferrous materials for electrical systems and lines.
CEI EN60947-2	Low Voltage Automatic circuit breakers (CEI 17-5)
CEI 17-11	Operating switches, disconnectors, air breakers-disconnectors and fuses combined units for rated voltages not greater than 1000V a.c. and 1500V d.c.
CEI EN60439-1	Low Voltage Switchgear and Control Gear Assemblies (CEI 17-13)
CEI 64-8	Electrical systems with rated voltages not greater than 1000V a.c. and 1500V d.c.

Italian Institute for Accident Prevention and Safety at Work  
(Istituto Superiore per la Prevenzione e Sicurezza del Lavoro)  
(ISPESL) Publication:

DPR 547	Accident prevention norms
---------	---------------------------

Italian National Institute for the Unification of Standards (Ente Nazionale Italiano di Unificazione) (UNI) Publication

UNI 5101	Hot-dip protective coatings: Characteristics, classifications and test on zinc coating on ferrous materials
----------	---

## 1.2 GENERAL REQUIREMENTS

Section 16050, "Basic Electrical Materials and Methods" applies to this section, with the additions and modifications specified herein. Equipment, materials, installation, and workmanship shall be in accordance with the required and advisory provisions of CEI EN60439-1 and CEI 64-8. Materials not normally furnished by the manufacturer of the equipment shall be provided in Section 16402, "Interior Wiring Systems." All switchboards shall be the product of one manufacturer.

## 1.3 SUBMITTALS

\*\*\*\*\*

### NOTE:

Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item is required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only

delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Recommended codes for Army projects are "RE" for Resident Engineer approval, "ED" for Engineering approval, and "AE" for Architect-Engineer approval. Codes following the "G" typically are not used for Navy projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

\*\*\*\*\*

Submit the following in accordance with the section entitled "Submittal Procedures".

#### SD-02 Shop Drawings

Switchboards; G

Furnish drawings for switchboards including, but not limited to, the following:

Overall dimensions and front view and sectional view.

Ampere ratings of bus bars.

Maximum short circuit bracing.

Circuit breaker type, interrupting rating, trip setting.

Provision for future extension.

One-line diagram.

Published time current curves, on full logarithmic paper, of the main circuit breaker and the largest feeder breaker showing protection and coordination are provided by the proposed circuit breakers.

#### SD-03 Product Data

Switchboards; G

Circuit breakers; G

Instruments; G

Current transformers; G

#### SD-06 Test Reports

##### Switchboard Paint Qualification Test

Furnish reports showing that the paint qualifications test of CEI 7-6 has been performed to ensure the adequacy of finishes to inhibit the build-up of rust on ferrous metal materials used for enclosures.

##### Switchboard Design and Production Tests; G

CEI EN60439-1. Furnish documentation showing the results of design tests on a product of the same series and rating as that provided by this specification. Furnish reports which include results of production tests performed on the actual equipment for this project.

Submit report of results of acceptance checks and tests; specified by paragraph entitled "Field Quality Control".

##### Ground resistance tests

Upon completion and before energizing electrical equipment, submit the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system and soil condition at the time the measurements were taken.

#### SD-10 Operation and Maintenance Data

##### Interior switchboards Data Package 5; G

Submit Operation and Maintenance Manuals in accordance with Section 01781, "Operation and Maintenance Data".

#### 1.3.1 Additions to Operation and Maintenance Manuals

In addition to requirements of Data Package 5, include the following on the actual interior switchboards provided.

- a. An instruction manual with pertinent items and information highlighted.
- b. An outline drawing, including front view and sectional view with items and devices identified.
- c. Prices for spare parts and supply list.
- d. Routine and field acceptance test reports.
- e. Time current characteristic (T-C-C) curves of breakers.

- f. Information on metering.
- g. Actual nameplate diagram.
- h. Date of purchase.

## PART 2 PRODUCTS

### 2.1 DISTRIBUTION SWITCHBOARDS

CEI EN60439-1. Switchboards shall be floor standing, dead front, metal enclosed, self supporting, front accessible. Devices shall be mounted in compartments. Each compartment shall have a separate hinged door. Circuit breaker operating handles shall extend through the compartment door. Switchboards shall be completely factory engineered and assembled including protective devices, interconnections, instruments and control wiring. Switchboards shall consist of incoming main circuit breaker section and distribution sections as indicated. Switchboard shall be designed for operation on a 380/220 volt three phase system with separate neutral and ground bus arranged for TN-S system.

#### 2.1.1 Phase Buses and Connections

Mount bus structure on insulated supports of high-impact, non-tracking, high-quality insulating material. Brace bus structure to withstand mechanical forces exerted during short circuit conditions when connected directly to a source having maximum of 50,000 amperes rms symmetrical short circuit current available. Bus bars shall be high conductivity copper with silver-plated joints. Plating shall be minimum 0.005 mm thick. Connect bus bars from main buses to the incoming circuit breaker studs. Provide cable supports for outgoing cables. Isolate cable compartments from bus compartments.

#### 2.1.2 Neutral Bus

Provide a full size isolated neutral bus of the same material as the phase bus bars.

#### 2.1.3 Ground Bus

Provide a copper ground bus secured to each vertical structure and extending the length of the switchboard. Equip ground bus with a terminal for connection to the service ground.

#### 2.1.4 Main Circuit Breaker

CEI EN60947-2. Manually operated stationary mounted molded case circuit breaker with an interrupting rating not less than 35,000 amperes symmetrical at 380 volts, 50 hertz. Equip breaker with solid-state trips, with current sensors, solid state logic and ground fault protection integral to the circuit breaker frame. The solid state current control shall provide adjustable ampere setting, long time delay, short time delay, and instantaneous trip so that feeder breakers will normally trip first on

overload and at lower fault-current levels. Long time and short time delays shall be set to provide the coordination described above.

#### 2.1.5 Secondary Feeder Breakers

Molded-case type breakers, 400A and larger, shall have a quick-make, quick-break operating mechanism and shall be equipped with ambient-compensated thermal magnetic trip devices having adjustable long time delay and instantaneous pickup. Circuit breakers less than 400A shall be thermal magnetic molded case type. All circuit breakers shall be mechanically trip free, and the handle position shall indicate whether the breaker is "on," or "off," or "tripped". An overload in one phase shall cause all three phases to trip.

#### 2.1.6 Indicating Instruments

Meter shall be electronic type indicating amperes and volts. Amps shall be indicated for L1, L2 and L3. Volts shall be indicated for L1-L2, L2-L3 and L1-L3. Minimum accuracy of 1.5 percent at full scale.

##### 2.1.6.1 Current Transformers

Current transformers shall be single ratio transformers, insulation class, 500 volts, 50 hertz.

#### 2.1.7 Nameplates

Provide nameplates as specified in Section 16050, "Basic Electrical Materials and Methods".

### 2.2 CORROSION PROTECTION

Bases, frames, and channels of switchgear and switchboards which come in contact with concrete shall be corrosion resistant and shall be fabricated of hot-dip galvanized steel.

#### 2.2.1 Galvanized Steel

UNI 5101 coating, as applicable. Galvanize after fabrication where practicable. UNI 5101 coating, as applicable. Galvanize after fabrication where practicable.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Electrical installations shall conform to manufacturer's recommendations, and to the requirements to CEI 64-8, specified herein. Provide new equipment and materials, unless indicated or specified otherwise.

### 3.2 GROUNDING

CEI 64-8 and Section 16402, "Interior Wiring System," except that grounds and grounding system shall have a resistance to solid earth ground not

exceeding 10 Ohms.

### 3.3 INSTALLATION OF EQUIPMENT AND ASSEMBLIES

Install and connect switchboards as indicated in project drawings, the approved shop drawings, and as specified herein. Receive, unload, store if necessary, install and connect as indicated and specified.

#### 3.3.1 Galvanizing Repair

Use galvanizing repair paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces that repair paint has been applied to.

#### 3.3.2 Wiring and Connections

Provide wiring and make connections as specified in Section 16402, "Interior Wiring Systems."

### 3.4 FIELD QUALITY CONTROL

#### 3.4.1 Performance of Acceptance Checks and Tests

Perform in accordance with the manufacturer's recommendations, and referenced herein. Include the following visual and mechanical inspections and electrical tests.

##### 3.4.1.1 Switchboard Assemblies

###### a. Visual and Mechanical Inspection

1. Inspect physical, electrical, and mechanical condition.
2. Compare equipment nameplate information with approved shop drawings.
3. Check for proper anchorage, required area clearances, physical damage, and proper alignment.
4. Inspect all doors, panels, and sections for paint, dents, scratches, fit, and missing hardware.
5. Verify that circuit breaker sizes and types correspond to approved shop drawings.
6. Verify that current transformer ratios correspond to approved shop drawings.
7. Inspect all bus connections for high resistance.
8. Clean entire assembly using manufacturer's approved methods and materials
9. Inspect insulators for evidence of physical damage or contaminated

surfaces.

10. Verify appropriate lubrication on moving surfaces.
11. Exercise all active components.
12. Inspect all mechanical indicating devices for proper operation.

b. Electrical Tests

1. Perform insulation resistance tests.
2. Perform over potential tests.
3. Perform insulation resistance test on control wiring. Do not perform this test on wiring connected to solid state components.
4. Perform control wiring performance test.
5. Perform secondary voltage energization test on all control power circuits and potential circuits.
6. Perform primary current injection tests on the entire current circuit in each section of switchboard.

3.4.1.2 Circuit Breakers - Low Voltage Power

a. Visual and Mechanical Inspection.

1. Inspect for physical damage and compare nameplate data with approved shop drawings.
2. Perform mechanical operational test in accordance with manufacturer's instructions.
3. Check tightness of connections.
4. Clean entire circuit breaker using approved methods and materials.
5. Lubricate as required.

b. Electrical Tests

1. Adjust breaker(s) for final settings in accordance with approved shop drawings.

3.4.1.3 Current Transformers

a. Visual and Mechanical Inspection.

1. Inspect for physical damage and check nameplate information for compliance with approved shop drawings.
2. Verify proper connection.

3. Verify tightness of all bolted connections and assure that adequate clearances exist between primary circuits and secondary circuit wiring.

4. Verify that all required grounding and shorting connections provide good contact.

b. Electrical Tests

1. Perform insulation resistance tests.

2. Perform polarity tests.

3. Perform ratio verification tests.

3.4.1.4 Metering and Instrumentation

a. Visual and Mechanical Inspection

1. Examine all devices for broken parts, shipping damage, and tightness of connections.

2. Verify that meter types, scales, and connections are in accordance with approved shop drawings.

b. Electrical Tests

1. Determine accuracy of meters at 25/50/75/100 percent of full scale.

3.4.1.5 Grounding System

a. Visual and Mechanical Inspection.

1. Inspect ground system for compliance with Contract plans and specifications.

b. Electrical Tests

1. Perform ground impedance measurements utilizing the three point method.

-- End of Section --